Chapter – 5 [A]

BUSINESS APPLICATION-ACQUISITION, DEVELOPMENT & IMPLEMENTATION

NEEDS AND BENEFITS OF SDLC

- Relevance of SDLC for Business Process Automation
- Need for SDLC
- Benefits of SDLC

SDLC & PHASES OF SDLC

Software Development Life Cycle (SDLC) is a process used in the software industry to design, develop and test high-quality software packages. It consists of a detailed plan describing how to develop, maintain, replace and alter or enhance specific software that meets or exceeds customer expectations, reaches completion within times, and cost estimates.

- Phase 1: Preliminary Investigation
- Phase 2: Requirement Analysis
- Phase 3: System Analysis & System Design
- Phase 4: Acquisition of System Resources
- Phase 5: System Development
- Phase 6: System Testing & User Training
- Phase 7: System Implementation
- Phase 8: Post-Implementation Review & System Maintenance

… cont.

- Phase 1: Preliminary Investigation
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- ❑ Problem Identification & Setting Objectives
- ❑ Feasibility Study
  - Technical
  - Financial
  - Economical
  - Scheduled
  - Resources
  - Compliance / Legal
  - Behavioural / Social
  - Operational
- ❑ Business Case

- ❑ Auditor's Role

... cont.

- Phase 1: Preliminary Investigation
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❑ Requirement collection [Document Review, Questionnaire, Interviews, and Observations]
❑ Analysing current system of working
  ▪ Source Document Review
  ▪ Input Review
  ▪ Processing Review
  ▪ Output Review
  ▪ Storage Review
  ▪ Security Review
❑ Preparation of SRS [System Requirement Specifications]

❑ Auditor's Role

… cont.

- Phase 1: Preliminary Investigation
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- ❑ System Analysis
- ❑ System Design
  - DFD
  - CASE Tools
  - Data Dictionary / Meta Data
  - System Component Matrix
  - Decision Table / Decision Trees
  - Screen Layouts [UI – UX]
  - Other
- ❑ Drafting SDR [System Design Report]

- ❑ Auditor's Role

… cont.

- Phase 1: Preliminary Investigation

- Phase 2: Requirement Analysis

- Phase 3: System Analysis & System Design

- Phase 4: Acquisition of System Resources

- Phase 5: System Development

- Phase 6: System Testing & User Training

- Phase 7: System Implementation

- Phase 8: Post-Implementation Review & System Maintenance

- ❑ Finalizing Specification
- ❑ Releasing ITT & RFP for inviting bids
- ❑ Vendor validation
- ❑ Documentations with Vendor

- ❑ Auditor's Role

... cont.

Phase 1: Preliminary Investigation

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Phase 8: Post-Implementation Review & System Maintenance

No direct involvement

- Auditor's Role
  - Debugging
  - Adhering of standards and compliance
  - Documentation

… cont.

- Phase 1: Preliminary Investigation

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- Phase 6: System Testing & User Training

- Phase 7: System Implementation

- Phase 8: Post-Implementation Review & System Maintenance

- ❑ System Testing
  - ▪ Black Box – White Box – Gray Box
  - ▪ Alpha – Beta
  - ▪ Unit – Integration – System
  - ▪ Regression
  - ▪ Security – Recovery
  - ▪ Stress / Volume
  - ▪ Quality – Functional – Structural – Legal
  - ▪ UAT
- ❑ User Training

- ❑ Auditor's Role

... cont.

- Phase 1: Preliminary Investigation
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- ❑ Pre-Requisites of Implementation
  - ▪ Site Preparation
  - ▪ Hardware & Networking Equipment Testing & Installation
  - ▪ Testing Completed Satisfactorily
  - ▪ Training & Job Scheduling
  - ▪ Data Conversion
- ❑ Implementation/ Conversion Strategies
  - ▪ Direct / Abrupt
  - ▪ Phased
  - ▪ Pilot
  - ▪ Parallel

- ❑ Auditor's Role

… cont.

- Phase 1: Preliminary Investigation
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- ❑ System Evaluation / Post Implementation Review
  - Development Evaluation
  - Operation Evaluation
  - Information Evaluation
  - Evaluation on the basis of Objectives
- ❑ Maintenance
  - Scheduled
  - Corrective
  - Adaptive
  - Perfective
  - Preventive
  - Rescue / Fire Fighting

- ❑ Auditor's Role

SYSTEM DEVELOPMENT APPROACHES / METHODOLOGIES

- Waterfall Approach
- Prototype Approach
- Incremental Approach
- Re-Engineering Methodology
- Reverse Engineering Approach
- Component-Based System Development Approach
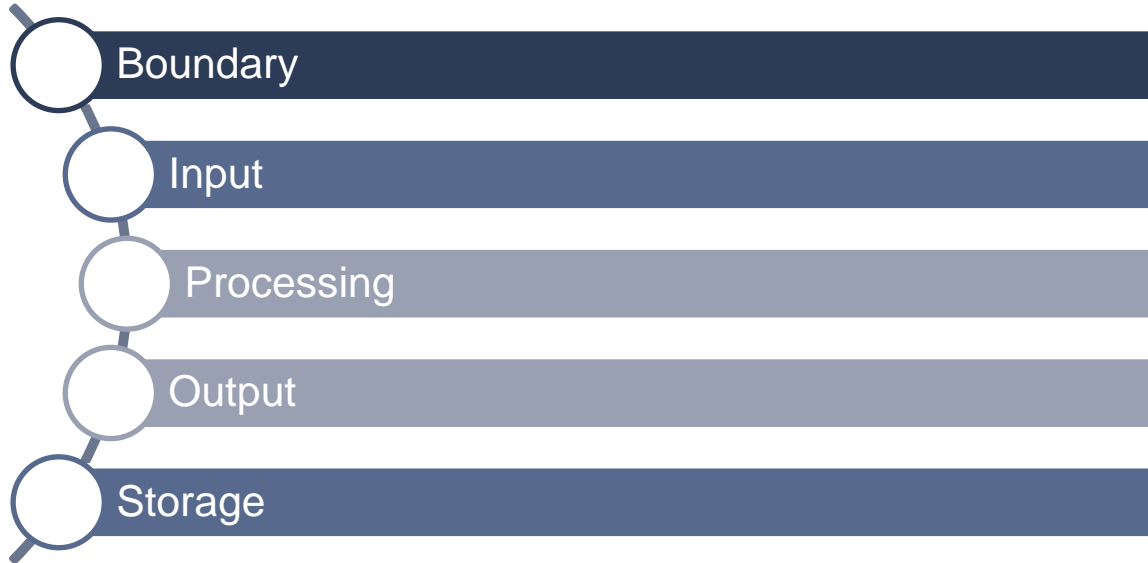- RAD Approach
- Agile Methodology

ADDITIONAL TOPICS

- DevOps
- DevSecOps
- Secure SDLC

APPLICATION CONTROLS & AUDIT

- Boundary
- Input
- Processing
- Output
- Storage

Chapter – 5 [B]

EMERGING TECHNOLOGIES

ARTIFICIAL INTELLIGENCE

- Artificial intelligence (AI) is an advanced computer system that can simulate human capabilities, based on a predetermined set of rules. Some of the activities computers with artificial intelligence are designed for include:

- Why AI is important?
    - AI automates repetitive learning and discovery through data
    - AI adds intelligence to existing products, e.g. Siri in new generation Apple products
    - AI adapts through progressive learning algorithms to let the data do the programming
    - AI analyzes more and deeper data using neural networks that have many hidden layers
    - AI achieves incredible accuracy through deep neural networks - which was previously impossible
    - AI gets the most out of data. When algorithms are self-learning, the data itself can become an intellectual property

- Type of AI
    - Weak AI / Narrow AI
    - General AI
    - Super AI

ARTIFICIAL INTELLIGENCE ... cont.

Advantages
- ➢ Error Reduction
- ➢ Difficult Exploration
- ➢ Daily Application
- ➢ Digital Assistants
- ➢ Repetitive Jobs
- ➢ No Breaks

Concerns
- ➢ High Cost
- ➢ No Replicating Humans
- ➢ No Improvement with Experience
- ➢ No Original Creativity
- ➢ Clerical Unemployment

Challenges for AI
- ➢ Computing is not that advanced
- ➢ Fewer people support
- ➢ Creating Trust
- ➢ One Track Minds
- ➢ Probability
- ➢ Data Privacy and security
- ➢ Algorithm bias
- ➢ Data Scarcity

Governance and Controls
- ➢ AI governance establishes accountability and oversight
- ➢ Ethical, social, and legal responsibilities
- ➢ Process and procedures
- ➢ Formality and structure

CLOUD COMPUTING

- Cloud Computing: Simply put, cloud computing is the delivery of computing services—including servers, storage, databases, networking, software, analytics, and intelligence—over the Internet ("the cloud") to offer faster innovation, flexible resources, and economies of scale.

- Advantages of Cloud Computing
  - Cost Efficiency
  - Reduce spending on technology infrastructure
  - Unlimited Storage
  - Backup & Recovery
  - Automatic Software Integration
  - Easy Access to Information and Globalize the workforce
  - Reduce Capital costs
  - Quick Deployment
  - Less Personnel training and minimize maintenance and licensing software
  - Improved Flexibility and effective monitoring of projects

- Concerns about Cloud Computing
  - Internet Connectivity
  - Technical Issues
  - Security in the Cloud
  - Prone to Attack
  - Availability
  - Interoperability
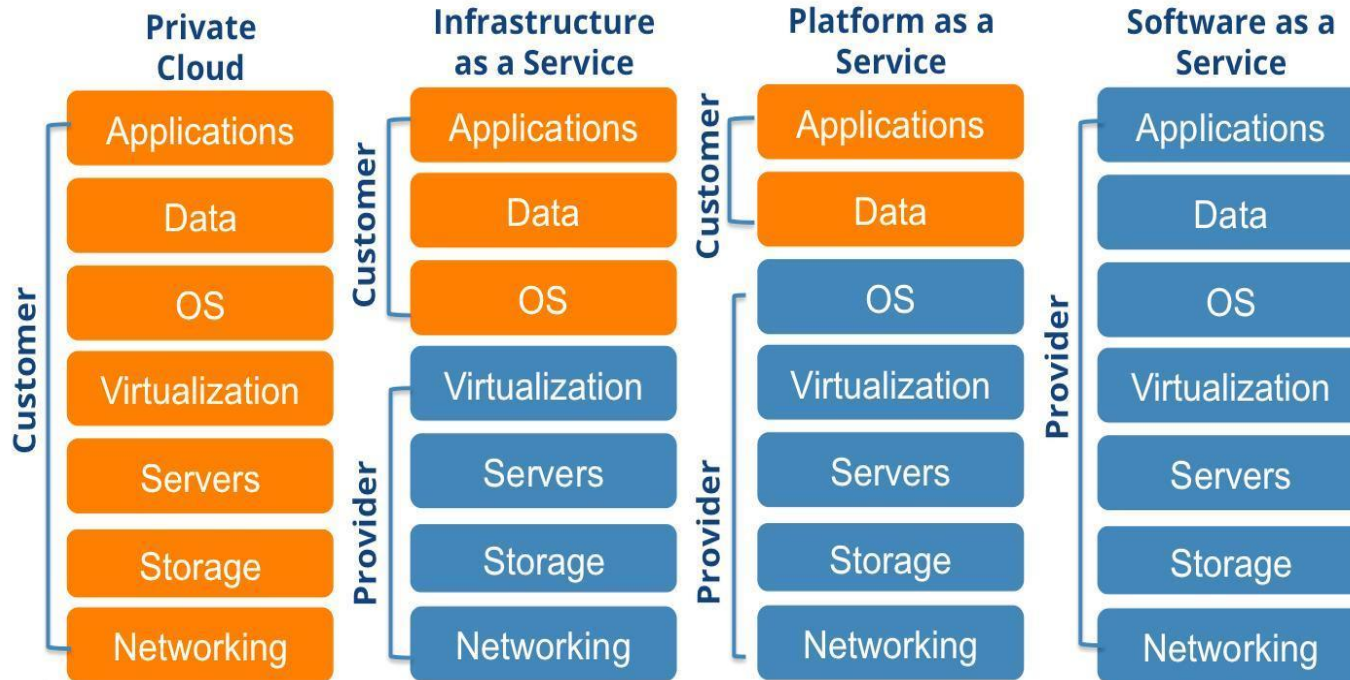
CLOUD COMPUTING ... cont.

- Types of Cloud Computing
  - Private
  - Public
  - Community
  - Hybrid

- Models of Cloud Computing
  - IaaS
  - PaaS
  - SaaS
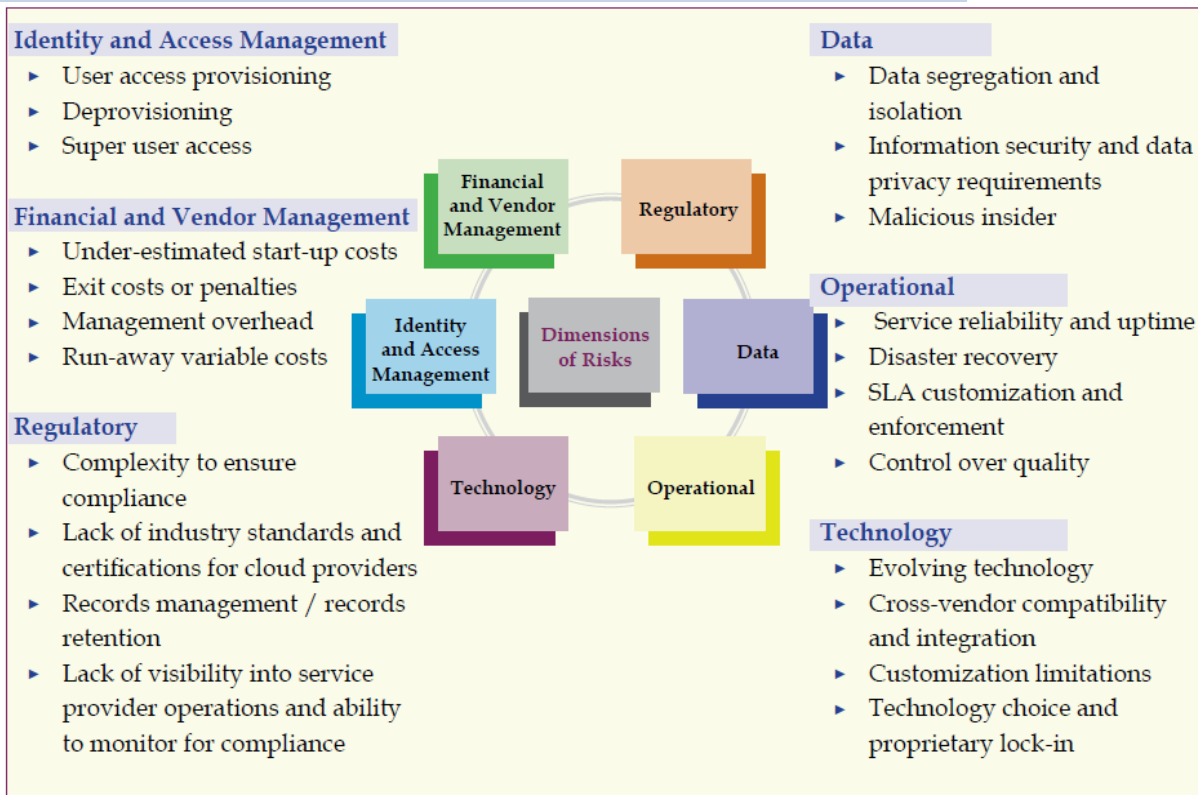
CLOUD COMPUTING … cont.

Risk and Challenges

➢ Greater dependency on third parties

➢ Increased complexity of compliance with laws and regulations

➢ Reliance on the Internet as the primary conduit to the organization's data

➢ Unclear responsibilities and accountabilities

➢ Compromised system security

➢ Invalid transactions or transactions processed incorrectly

➢ Failure to respond to relationship issues with optimal and approved decisions

Governance and Control

➢ Governance of Cloud Computing Services

➢ Enterprise Risk Management

➢ IT Risk Management

➢ Third-party Management

➢ Legal Compliance

➢ Right to Audit

➢ Certifications
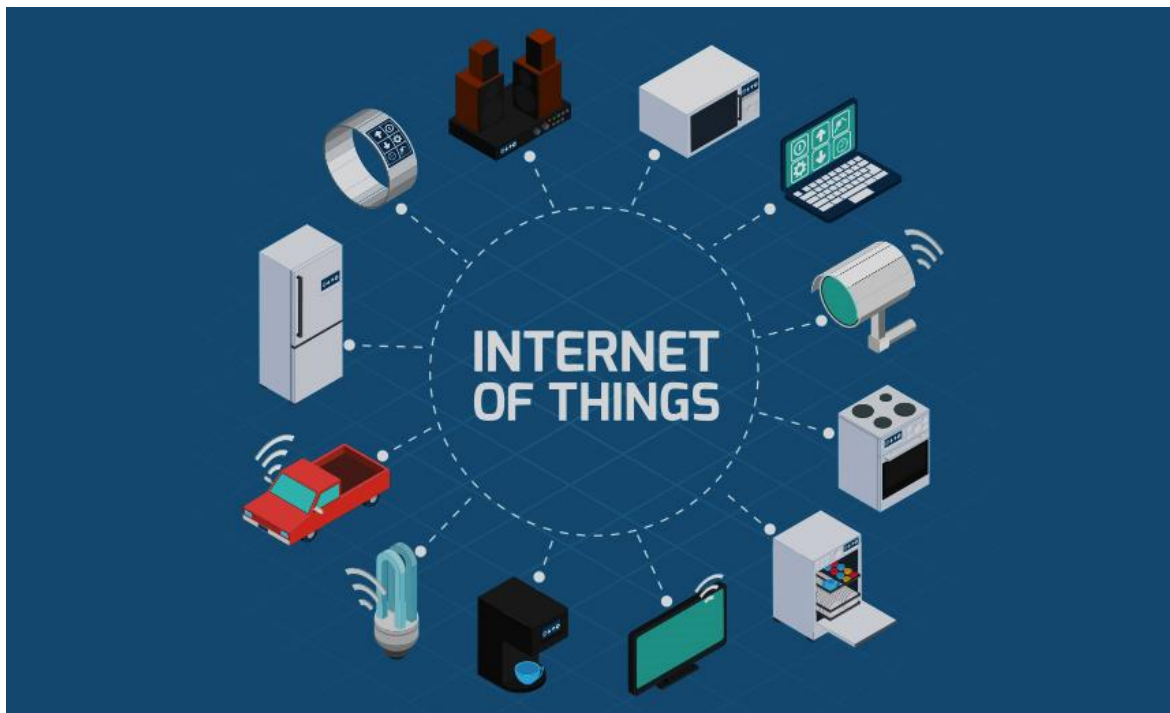
➢ Service Transition Planning

CLOUD RISK CLASSIFICATION

Identity and Access Management
- User access provisioning
- Deprovisioning
- Super user access

Financial and Vendor Management
- Under-estimated start-up costs
- Exit costs or penalties
- Management overhead
- Run-away variable costs

Regulatory
- Complexity to ensure compliance
- Lack of industry standards and certifications for cloud providers
- Records management / records retention
- Lack of visibility into service provider operations and ability to monitor for compliance

Data
- Data segregation and isolation
- Information security and data privacy requirements
- Malicious insider

Operational
- Service reliability and uptime
- Disaster recovery
- SLA customization and enforcement
- Control over quality

Technology
- Evolving technology
- Cross-vendor compatibility and integration
- Customization limitations
- Technology choice and proprietary lock-in

Financial and Vendor Management

Regulatory

Identity and Access Management

Dimensions of Risks

Data

Technology

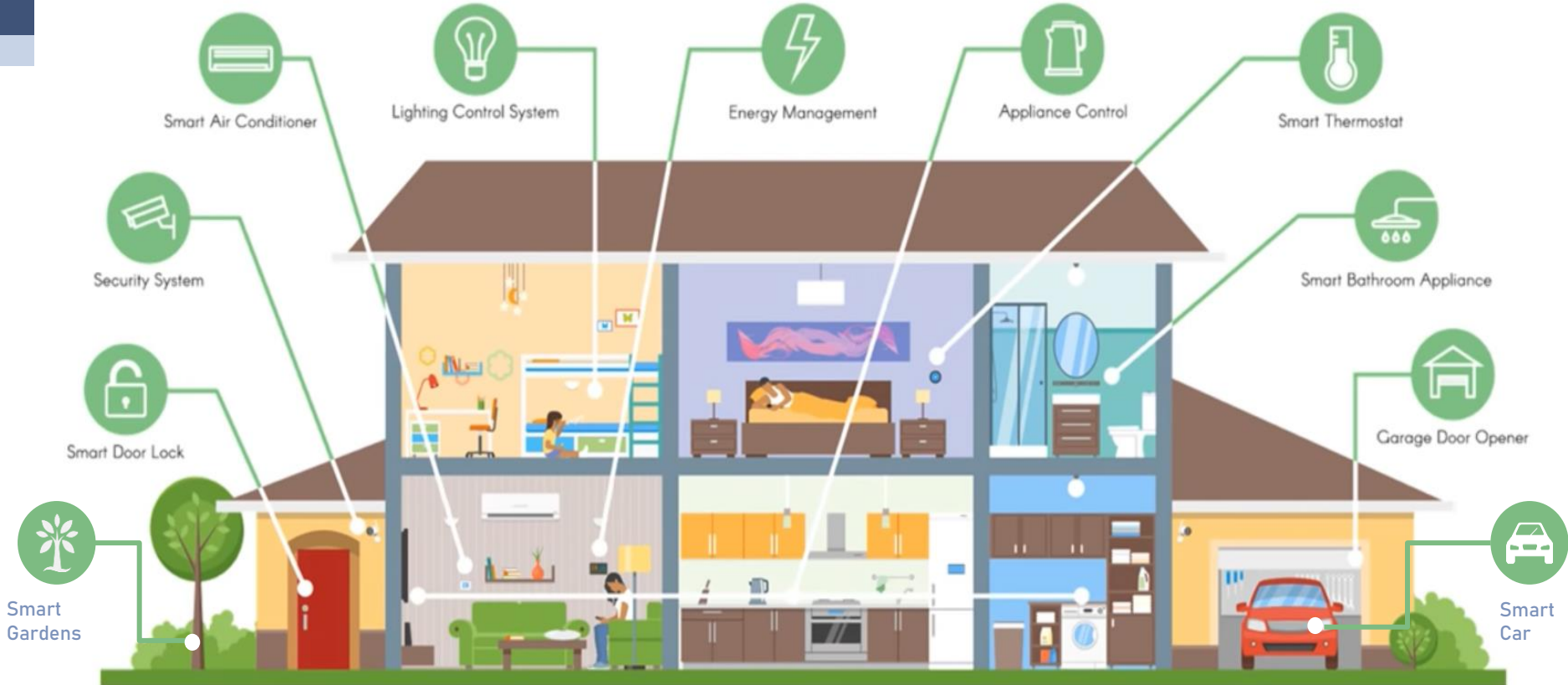Operational

INTERNET OF THINGS [IoT]

INTERNET OF THINGS [IoT]

- **The Internet of Things, or IoT,** is a system of interrelated computing devices, mechanical and digital machines, objects, animals, or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.

- **Benefits of IOT**
  - ➢ Monitor their overall business processes
  - ➢ Improve the customer experience
  - ➢ Save time and money
  - ➢ Enhance employee productivity
  - ➢ Integrate and adapt business models
  - ➢ Make better business decisions and
  - ➢ Generate more revenue

- **Challenges of IoT**
  - ➢ Insecure web interface
  - ➢ Insufficient authentication/authorization
  - ➢ Insecure network services
  - ➢ Lack of transport encryption
  - ➢ Privacy concerns
  - ➢ Insecure cloud interface
  - ➢ Insecure mobile interface
  - ➢ Insufficient security configurability
  - ➢ Insecure software/firmware
  - ➢ Poor physical security

A home automation system is a smart system!

Smart Air Conditioner

Lighting Control System

Energy Management

Appliance Control

Smart Thermostat

Security System

Smart Bathroom Appliance

Smart Door Lock
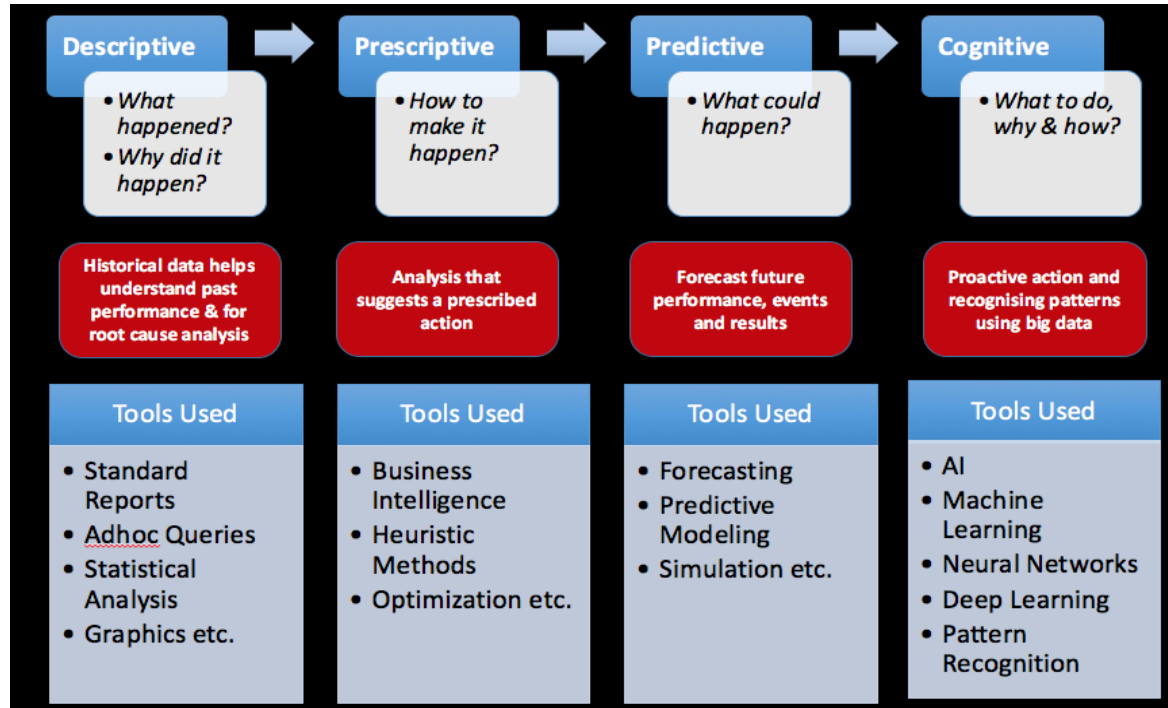
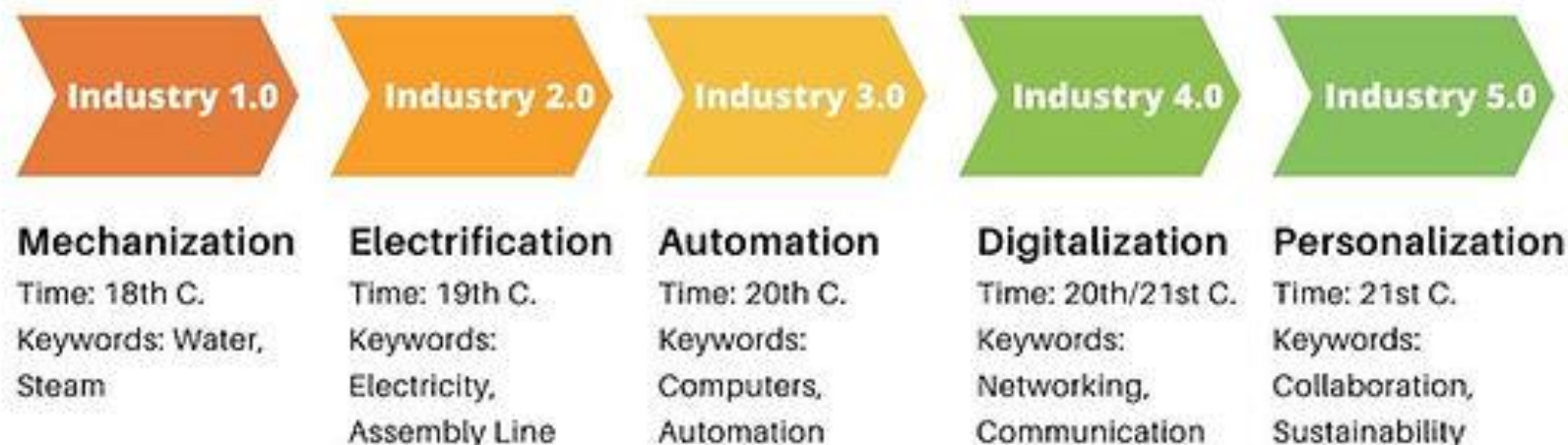Garage Door Opener

Smart Gardens

Smart Car

DATA ANALYTICS

- **Data Analytics** is the science of examining raw and unprocessed data to conclusions from the information thus derived. It involves a series of processes and techniques designed to take the initial data, sanitize it, remove any irregular or distorting elements, and transform it into a form appropriate for analysis to facilitate decision-making.

- **Types of Data Analytics**
    - Descriptive analytics
    - Predictive Analytics
    - Prescriptive analytics
    - Cognitive Analytics

INDUSTRY 1.0 - INDUSTRY 5.0

Industry 1.0	Industry 2.0	Industry 3.0	Industry 4.0	Industry 5.0
Mechanization	**Electrification**	**Automation**	**Digitalization**	**Personalization**
Time: 18th C.	Time: 19th C.	Time: 20th C.	Time: 20th/21st C.	Time: 21st C.
Keywords: Water, Steam	Keywords: Electricity, Assembly Line	Keywords: Computers, Automation	Keywords: Networking, Communication	Keywords: Collaboration, Sustainability

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DATA ANALYTICS

Risks and Challenges

- Data privacy and confidentiality

- Completeness and integrity of the extracted client data may not be guaranteed

- Compatibility issues with client systems

- Audit staff may not be competent in understanding the exact nature of the data and output

- Insufficient or inappropriate evidence retained on file due

- As large volumes will be required, firms may need to invest in hardware to support such storage

- An expectation gap among stakeholders

ROBOTICS PROCESS AUTOMATION

RPA is...

- Computer-coded software
- Programs that replace humans performing repetitive rules-based tasks
- Cross-functional and cross-application macros

RPA is not...

- Walking, talking auto-bots
- Physically existing machines processing paper
- Artificial intelligence or voice recognition and reply software

Objectives for RPA Implementation

- Improve accuracy
- Reduction of monotonous work
- Higher efficiency
- Manage controls
- Skill upgradation of personnel
- Cost saving
- Improve customer experience

ROBOTICS PROCESS AUTOMATION

- **Risks**

  - RPA strategy risks

  - Tool selection risks

  - Launch/project risks

  - Operational/execution risks

- **Challenges of RPA**

  - Shortage of skilled resources

  - Lack of proper team structure

  - Unable to automate end-to-end cases

  - Vaguely defined business continuity plans

Some Examples

- Call Centre Operations

- KYC Process / Loan Document Processing in Banks

- Scheduling and shipment tracking in Logistic

- Compliance Reporting

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- A blockchain is a distributed database shared among a computer network's nodes.

- Blockchain is a shared database that differs from a typical database because a traditional database is centralized and stores complete data. In contrast, blockchains store data in blocks linked together via cryptography and are not centralized.

- As new data comes in, it is entered into a new block. Once the block is filled with data, it is chained onto the previous block, which makes the data chained together in chronological order.
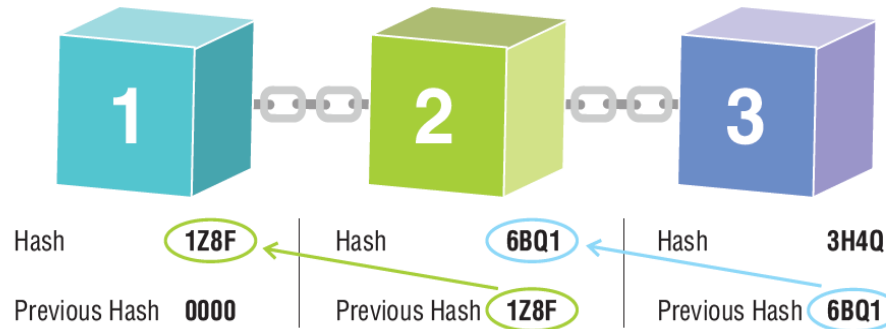
Data-->hash-->hash Of The Previous Block

BLOCKCHAIN

- **Technologies that make Blockchain possible**
  - Peer-to-peer network (distributed ledger)
  - Public key infrastructure (blockchain addresses)
  - Hash function (miner)

- **Advantage of Blockchain Technology**
  - Improved accuracy by removing human involvement in verification
  - Cost reductions by eliminating third-party verification
  - Decentralization makes it harder to tamper with
  - Transactions are secure and efficient
  - Transparent technology

- **Concerns with Blockchain Technology**
  - Significant technology cost associated with mining
  - Low transactions per second
  - History of use in illicit activities
  - Susceptibility to being hacked.

" Two-thirds of the Earth is covered with Water and the rest one-third is covered with Auditors from different verticals evaluating the business operations from different angles.

- Dr. Saurabh Maheshwari

THANKS!

Any questions?